DOCUMENT RESUME

ED 400 402 CE 072 722

AUTHOR	Gray, Lynton; Warrender, Ann-Marie
TITLE	Evidence for Action. Papers Prepared for FEFC's Learning & Technology Committee. FEDA Paper.
INSTITUTION	Further Education Development Agency, London (England).
REPORT NO	ISSN-1361-9977
PUB DATE	96
NOTE	24p.
AVAILABLE FROM	Further Education Development Agency, Publications Dept., Mendip Centre, Blagdon, Bristol BS18 6 RG, United Kingdom (6.50 pounds).
PUB TYPE	Reports - Research/Technical (143) -- Collected Works - Serials (022)
JOURNAL CIT	FE Matters; v1 n5 1996
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Adult Education; *Community Colleges; Computer Uses in Education; Distance Education; Educational Change; *Educational Practices; *Educational Technology; Educational Trends; Foreign Countries; *Industrial Training; Internet; *Multimedia Instruction; Open Education; Student Centered Curriculum; Technical Institutes; Technological Advancement; Two Year Colleges
IDENTIFIERS	Canada; *United Kingdom; United States

ABSTRACT

This document contains four reports on technology and further education (FE) that Lynton Gray and Ann-Marie Warrender prepared for the Further Education Funding Council's Learning and Technology Committee. The first report, "Main Themes from Learning & Technology Committee Press Surveys," examines three themes that were identified during a review of British press coverage of the role of information/learning technologies in FE: technological developments, organizational changes and learning applications. "Learning and Technology in American Community Colleges," which is based on materials presented at an American Association of Community Colleges convention, discusses the following topics: technology and teaching, distance learning, technologies and the Internet, and industry and student-centered learning. "Multimedia and Education," which is based on materials presented at an Association for the Advancement of Computing in Education conference, examines the following topics: technology for teachers, breaching the technological barriers, the impact of national initiatives, publishing and multimedia, and Canada's Open Learning Agency. "Learning Technologies in Industrial Training" explains the uses of information and learning technologies by a small sample of British companies in their own training programs. The implications of the four papers for reform of FE are summarized in a final section titled "Evidence for Action." (MN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 400 402

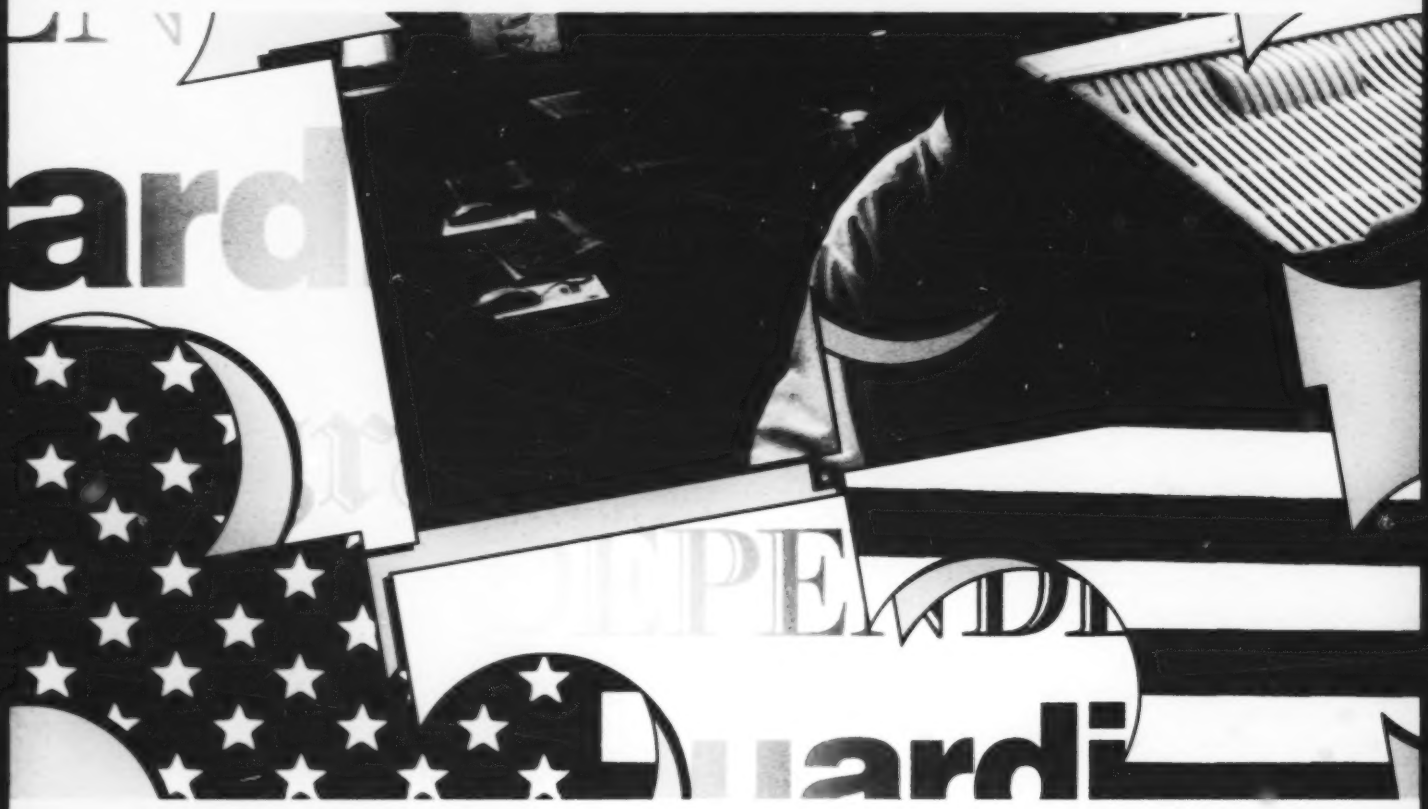
FEDA Further Education Development Agency

Evidence for action

Papers prepared for FEFC's Learning & Technology Committee

Lynton Gray and Ann-Marie Warrender

Volume 1 Number 5



CE027214

BEST COPY AVAILABLE

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

FEDA Further Education Development Agency

Evidence for action

Papers prepared for FEFC's Learning & Technology Committee

Lynton Gray and Ann-Marie Warrender

FE MATTERS

FEDA paper

Copyright © Further Education Development Agency 1996

Registered charity: 104415

ISSN: 1361-9977

Cover design: Mike Pope. Thanks to Halton College for the photograph and to the *Guardian*, *Daily Telegraph* and *Independent*.

Designer: Mike Pope

Editor: Oliver Thornton

Printer: Blackmore Press, Shaftesbury, Dorset

Contents

Introduction 3

1. Main themes from Learning & Technology Committee press surveys 5
   - Technological developments
   - Organisational changes
   - Learning applications
2. Learning and technology in American community colleges 11
   - Technology and teaching
   - Distance learning
   - Technologies and the Internet
   - Industry and student-centred learning
   - Summary
3. Multimedia and education 15
   - Technology for teachers
   - Breaching the technological barriers
   - The impact of national initiatives
   - Publishing and multimedia
   - The Open Learning Agency
   - Conclusions
4. Learning technologies in industrial training 18
5. Evidence for action 20

FEDA publications 22

Introduction

The findings and recommendations of the Further Education Funding Council's Learning & Technology Committee were published in January 1996. From its outset in October 1993 the Committee sought support from The Staff College (later FEDA) in undertaking research and providing information on issues relating to the applications of technology in supporting learning. This included the preparation of a number of reports and background papers for the committee, as well as a regular press cuttings service.

A report on the major Staff College research programme for the committee, on the uses of information and learning technologies in English further education colleges was published by FEDA in September 1995 (*Learning and technology in further education colleges*, Lynton Gray and Ann-Marie Warrender). This issue of FE Matters brings together another four reports and papers prepared over the past 18 months by the same two researchers for the Committee. They are published as a contribution to the debate across the FE sector following the publication of the Committee's final report. Some of the papers have been revised in the light of further investigations by the FEDA research team. Between them, they should provide a flavour of the evidence which helped the Committee arrive at its recommendations.

The first paper draws together the main themes from the regular press surveys undertaken from October 1993 to July 1995 for the Committee by The Staff College/FEDA Information Service, amounting to over 2,000 items. The paper is organised in the three broad categories in which the press cuttings were catalogued for the committee:

- technological developments
- organisational changes
- learning applications

This review of nearly two years' press coverage of information and learning technologies is inevitably partial. It provides insights into the rapidly changing technologies and their applications in the FE environment over the period that the Learning & Technology Committee came to the conclusions and recommendations of its final report.

The second and third papers are based on reports to the committee on visits to major North American conferences, organised by the American Association of Community Colleges (Paper 2) and the Association for the Advancement of Computing in Education (Paper 3). The reports drew on conference presentations and demonstrations along with visits to innovative community colleges in Minnesota and British Columbia. The papers point to some (then) current applications of technology relevant to FE colleges as well as the aspirations of users from further technological progress.

The final paper summarises a more detailed report prepared for the committee on the uses being made of information and learning technologies by a small sample of major British companies in their own training programmes. The companies share with the American colleges of the two previous papers an emphasis on using technologies to support relatively traditional classroom-based and instructor-led teaching rather than individualised and distance learning.

1. Main themes from Learning & Technology Committee press surveys

From its third meeting in March 1994 until July 1995, the committee made use of a regular press cuttings service to help keep track of developments relevant to its work. The press cuttings were organised in three broad categories:

- technological developments
- organisational changes
- pedagogical applications

Key themes arising from the press surveys in each of these categories are summarised below.

Technological developments

Technology and the labour market

There has been much press coverage of ways in which developments in IT have made a cost-effective and flexible workforce the inevitable way forward for British companies. They are matched by more critical reports that temporary, fixed term contracts are on the increase with one-third of companies employing senior staff on a relatively short-term contractual basis. 'Flexitime' technologies support these trends. The belief that IT offers increased opportunities for female workers is dented by reports of trends. Various press reports indicate that most of the students enrolled on university IT-related courses are male and only ten per cent of members of the British Computer Society are female.

Many press reports have plotted ways in which technology has reduced and deskilled the workforce. Many traditional jobs have become obsolete, but this has led to greater efficiency and greater customer satisfaction. An increasing number of companies now employ 'teleworkers' — staff who work on computers from home, heralding the age of the 'virtual office'. One company in seven in a recent 300 company survey uses teleworkers.

The long-promised 'paperless office' is still a long way off: only five per cent of global information is stored on-line and computers are stimulating the sales of printers, fax machines and paper.

Technology is reported as a means of checking and reversing rural depopulation and economic decline. 'Electronic community' experiments in rural Wales, the Hebrides and Bristol have attracted press coverage with their promises, not yet fulfilled, of teleworking and telelearning.

New products and new technologies

Computer hardware doubles in power every year and a half. Much of the extra power is required, however, to drive increasingly sophisticated and disc-hungry software. In consequence, both hardware and software rapidly become obsolete.

Press coverage tends to polarise choices — TV or the PC, cable or satellite, BT or its competitors, and CD-ROM or the Internet. The PC rather than the TV set is forecast as the focus for multimedia services in the home. Multimedia PCs packaged in a single cabinet including CD player, stereo system, a TV and video player, telephone-answering system and facsimile machine, complete with modem for attachment to the telephone network, are already available. In 1994 world-wide sales of multimedia personal computers quadrupled. However, reported research by market analyst IDC found that only 25 per cent of UK households had a PC, with only ten per cent thinking of making a purchase this year and two-thirds of households having no purchase plans.

There is extensive coverage of TV-based video-on-demand trials which incorporate home shopping (more popular with the press than with consumers), video games and sports.

CD-ROMs are ten years old, with costs falling, capacity increasing and sales of players and discs booming in USA and Europe. Coverage has focused on:

- the relative merits of CD-ROM and the Internet as interactive data-carrying media
- CD-ROMs that combine elements of education and information with entertainment (edutainment)

- the fortunes of competing systems — CD-I, CDTV, etc.
- new products including high density video CDS, CD Plus and CD recorders for home recording

Progress towards the 'one-step' device integrating PC and TV has been a regular forecast, with the expectation that the PC will supplant the TV as the heart of the household 'edutainment' system.

There has been much press interest in the promises and problems of handwriting and voice recognition. The promises are that keyboards will 'within months' become redundant, but the problems *en route* are well documented.

Smart cards (plastic cards embedded with a computer chip) are forecast to become part of daily life. Their potential uses — to claim benefit payments, pay road tolls, pay-for-TV services — attract stories that they will completely replace the role of cash. The pilot scheme in Swindon whereby people can assign as much cash as they like into their card for immediate use was scrutinised. The press coverage highlighted potential problems, including infringement on civil liberties, as it would essentially be an ID card.

The falling costs of virtual reality games, using cheap (£200) headsets, feature strongly in recent stories about the changing market for computer games. Multimedia applications on open systems are expected by most reporters to replace the current generation of cartridge games on dedicated games machines.

The Internet

The Internet is now 27 years old, but has had more press coverage in the last year than in the rest of its history. Its growth in terms of users and the Internet access industry is plotted regularly: in August 1995 it was estimated that there were six million host computers and 60 million users with at least one million more signing up each month. It is anticipated that the Internet will be a part of most homes in industrialised countries within a decade, but is likely to exclude poor and elderly people.

Much of the coverage is sensationalised with stories about pornography easily accessible to children. Other coverage offers instruction in Internet access, browsers, uses and 'netiquette'. Some is disparaging, describing it as a 'network for academics and boffins' and likening it to a muddy pathway rather than a superhighway ('the superhypeway'). Problems of encryption and authentication of e-mail messages still need to be resolved.

Applications include seeking jobs and university/college places. Companies are reported to be using the Internet increasingly for selling products, with claims that it offers small businesses and large organisations excellent opportunities to advertise their products to a potentially very large audience. Other reports are more sceptical, claiming that its main uses will remain education and entertainment.

The Clinton/Gore advocacy of the information superhighway in the US government's National Information Infrastructure: Agenda for Action has attracted speculation about UK governmental interest in information highways and on-line services. Proposals from the Departments of Trade & Industry, Education and National Heritage in 1994-5 attracted moderate press coverage, as did Labour Party proposals for a cable-based University for Industry and a new regulatory framework which would empower BT to provide optic fibre connections to every home in Britain.

Crime and security

Press interest in crime is as marked in technology reports as elsewhere. Enterprising hackers get full press coverage, especially where their targets are banks and government offices. Corporate crime involves supplying counterfeit software products and patent offences.

As Internet facilities increase, their criminal applications interest the press, who ring alarm bells and demand the tightening up of Net security. The press is intrigued by defamation and libel on the Internet and the availability of pornography.

Products such as voice recognition systems are being developed to improve information and computer security. Signature verification software is reported as effective against credit card and benefit fraud, etc.

Software piracy is a global problem: it is estimated that in China 94% of software in use is copied. Court cases on infringement of patent and copyright which may affect the availability of software and its distribution attract press attention. Intellectual property law and its effect on the success of the development and use of the information infrastructure is in need of clarification. The introduction of technologies that allow people to record on CD-ROMs could result in big reductions in profits for companies so the press speculates that copyright owners will discourage the adoption of technology capable of reproducing high-quality copies of their material.

Organisational changes

The computer market is becoming increasingly competitive and companies need to expand by at least 20% each year in order to survive and continue to compete. Much of the business news concerns the manoeuvres of the converging IT-based industries and their mergers, take-overs and joint ventures.

Coverage of the link-ups between Novell and WordPerfect, IBM and Apple and the global media/entertainment companies (particularly the US Disney/ABC merger) pointed to the convergence of the computer, tele-communications and media industries and to the ways in which large software companies increasingly produce in-house developments by acquiring smaller, specialised companies.

Microsoft's much delayed launch of Windows 95 generated the greatest number of column inches with claims that it, through Microsoft Network (its Internet gateway), will revolutionise the way people learn and communicate. The media hype and enormous marketing budgets attracted as much coverage as the product itself.

Much of the press coverage considered the implications of the dominance of Microsoft as the world's most successful software company. Its link-ups with Sony for developing super-highway products and Tele-Communications, the largest US cable-TV operator, generated stories that it would provide an 'end-to-end software solution' for interactive TV, including distributed operating system software for connecting television set-top boxes and PCs with a wide variety of services.

IBM's varying fortunes have been closely followed. Its difficulties in breaking into the PC market and its enormous job-shedding programme preceded stories about its more aggressive marketing strategies and its slowly increasing profitability.

There has been obvious press interest in the response of newspapers to the new technologies. The growth of on-line electronic newspapers has been recorded, with forecasts of software 'agents' used to select the news items which come together as personalised newspapers within the next decade. Will these be on subscription or be free newspapers, paid for by advertisers and sponsors?

Learning applications

Home-based and distance learning

As an increasing number of 'virtual courses', including FE courses, became available over the Internet, press coverage featured new learning opportunities, such as the ability to log on to a MBA course from a PC and attend a lecture by walking into a virtual classroom. This is seen as extremely beneficial for those people who want to improve their qualifications, but cannot afford to give up their full-time jobs.

International examples of the uses of new technologies to re-invigorate distance learning are frequent. In the USA the Public Broadcasting Service (PBS) introduced new telecourses, making it possible for Americans to gain various degrees from home, while the Open University in the UK launched its first course on compact disc. The opportunities for marketing distance learning courses internationally are also reported, for example the Mind Extension University's penetration of Taiwan and Thailand.

Reported applications of technologies which support distance learning include the establishment of World Wide Web home pages by providers (universities and colleges) to indicate what courses are available, and the prospects of 'pay-as-you-view' systems which would eliminate problems of collecting course fees.

As an alternative to formal training, many large organisations, particularly major financial institutions, are reported to be offering staff the opportunity of distance learning. This is made possible by the CD-ROM and its low costs. The combination of voice, video, text and graphics allows managers to interact with the 'computer-tutor' in a way that is proving effective and popular. The prospects of NVQ training through multimedia are being considered and the first products reviewed. The advantages — eliminating the need for students to assemble in a classroom at some central location and dramatic falls in per capita costs — make it an extremely desirable option. It is argued that NVQ training by multimedia is more interesting to employees than traditional methods, so that some employees are motivated to do some training in their own time.

School/college-based learning

The educational potential of the 'information superhighway' is widely discussed.

The need for a regulatory framework which encourages educational as well as entertainment and commercial uses is advocated by the Labour Party and others. There is concern that financial gain will determine development rather than educational need.

Pilot schemes which link schools to the Internet attract press coverage. The Internet is reported as the way forward, offering a huge source of information at students' fingertips. Other reports dwell on current problems of selectivity and the technical challenges posed by Internet access.

CD-ROM databases and interactive CD-ROMs are reported to have been introduced into many schools and colleges, making learning both enjoyable and accessible. Reviews of the growing numbers of multimedia products for schools are accompanied by reports of the initiatives by the Departments of Trade & Industry and Education to encourage private sector sponsorship and other support for multimedia education.

'Edutainment' is the latest market to be exploited by software companies. It is a new blend of entertainment and education. For example the Mario Brothers will no longer be just a game; it will also have an educational element. Edutainment is to be directed at children aged between eight and 14.

The introduction and evaluation of American Integrated Learning Systems (ILS) attracts press coverage. Pilot schemes have revealed that it can have a significant effect on under-achievers and reluctant learners.

Recurring reports of the challenges faced by teachers in using the available technologies focus on their lack of time to absorb the technologies and newly available teaching materials. Support for teachers through, for example, the Schools Technology Helpline in South Wales is reported, along with other pilot projects, to link teachers and students in remote and disadvantaged communities.

Learning management innovations also attract some attention. Student tracking might be facilitated by the use of 'active badges' and sensors. Barcodes, swipe cards and radio signals in some innovative schools and colleges are reported as vehicles for facilitating student registration and access to learning resources.

The high-technology library

Pilot schemes in which libraries provide community Internet access are reported along with plans for them to be connected using Internet, local, national and regional databases and interactive facilities. It is suggested that these changes would improve available facilities and extend library participation.

The *Follett Report* (1993) on university libraries and its consequences have attracted press coverage. In 1994-5, £4.75 million was provided

to promote the use of IT in libraries. Priority areas include electronic document and article delivery, electronic journals, electronic storage of journals, on-demand publishing to support students in their work, training and awareness of information resources, and access to network resources.

2. Learning and technology in American community colleges

One of the committee's terms of reference was to take account of 'the potential impact of new developments in technology, in this country and abroad, on the learning process'. Developments in this country were examined by The Staff College (now FEDA) and NCET through two substantial research studies, which have since been published.[1] The committee also received reports on overseas developments following study visits by committee members and advisers.

Two of the reports to the committee followed visits to major North American conferences, with accompanying visits to innovative community colleges in Minnesota and British Columbia. These reports outline some key trends in the uses of technology for teaching and learning in the American community college sector.

Technology and teaching

The American Association of Community Colleges (AACC) annual convention provides a snapshot of current concerns, interests and initiatives in the North American community college sector. Incentives generated by a distinctively North American enthusiasm for awards are showcased at the annual conference, and provide an opportunity to examine new applications of information and learning technologies. Successful innovations (not just in information and learning technologies) are encouraged and promoted through state and national awards. The latter include the AACC/IBM Networked Distributed Education Award — one winner linked college classes in Hawaii with similar Australian classes — and the Instructional Telecommunications Council's regional and national annual awards for colleges and individuals.

1 Lynton Gray and Ann-Marie Warrender *Learning and technology in further education colleges* (FEDA, 1995); and *Technology and learning in the further education sector* (NCET, 1995)

As emphasised in other reports to the committee from North America, the applications of educational technology in the US and Canadian post-school sectors are primarily for teaching rather than for learning purposes. A consensus view from the group of about 20 UK senior college managers who visited the community colleges was that they envied the resources available (and in particular the abundant space both within and outside college buildings), but were less impressed with the applications of those resources to the learning needs of the college's students and its wider communities. Although there was talk everywhere of resource constraints and pressures, they did not seem (as yet) to have stimulated the radical re-appraisal of learning needs and the roles of teachers and other staff which has occurred across the UK's FE sector.

The influence of the teaching force as an organised, unionised influence on college management is very powerful (and not just in Minnesota). Teachers have large classes, high salaries but relatively light teaching loads by UK standards (15 hours per week; they can then earn very substantial additional overtime payments). They are, therefore, expensive resources and considerable investment has been made in technologies designed to enhance the efficiency of those resources.

Much of this investment is aimed at distributing the teaching more widely, especially across sparsely populated areas, where community colleges have satellite centres and where colleges have merged. This trend is accentuated by current enthusiasm across the US for state-wide mergers of all their community colleges with state universities and other state-funded post-school institutions. Satellite, microwave and telephone lines are used to carry teachers' wisdom to otherwise uneconomically small groups of students on several sites. Cost-benefit analyses of the different communications systems have been undertaken before investing.

However, teachers are not taking to the new learning technologies enthusiastically. Colleges and states are, therefore, making very heavy investments in 'multimedia faculty training centers' — staff development facilities equipped

with state-of-the art technologies and a team of expert tutors. Teachers are released full- or part-time to be trained in the relevant presentation skills and given additional bonus payments (of about £100 per day) as attendance allowances. In consequence, some colleges have a growing number of staff capable of teaching 'telecourses'. E-mail and video-conferencing facilities augment those for distance teaching, to put students on the satellite sites in touch with tutors and students on other sites. The basic purpose is to create the 'virtual classroom' rather than to encourage independent, technology-based learning.

Distance learning

Radical voices are drawing attention to the need to re-appraise conventional practice in the colleges and 're-engineer' them to improve their efficiency (by reducing the period it takes to qualify) and to address new markets, especially adult learners. 'Telelearning' is advocated as an approach to reduce the period for achieving a part-time degree from six years on average to three years. It is also seen as the vehicle for reaching out to the 50 million adults already involved in learning 'outside academe'; the phrase is significant: community colleges perceive themselves very much as part of the American HE system.

A growing proportion of potential students are 'teleworkers' who work and can study at home. The US Bureau of Labor forecasts that these will number 25 million by the year 2000, and points to the savings in transport costs and air pollution when they no longer commute to work. For some, 'telelearning' is the future for American mass HE, delivering learning more productively at a time when educational costs are a serious political issue; aided by state legislation it will give access by right to educational cable and related services to registered students.

With these ends in mind, interest now extends beyond the efficient transmission of college courses via cable and satellite to the use of technologies which support interaction between learners and tutors, and which support learning through electronic registration, library services, guidance and computer-based assessment.

Community colleges are being encouraged to co-operate to achieve these ends. One extreme aspect of this is the state-wide mergers referred to on page 12. However, co-operation is also promoted as a means of resisting the growing backlash from traditionalists who wish to eliminate telecourses. Collaboration is promoted as an effective and efficient way of producing course and support materials, with the motto 'export the best and import the rest'. This is a direct challenge to the traditional view that teachers should develop their own course materials (never as powerful an ideology in the States as it has been in Britain). Collaboration extends to state-wide staff development centres and to the development of training materials for both staff and students to provide them with the distinctive skills needed for telelearning.

Technologies and the Internet

Technology for community colleges is big business across the USA. The major computer hardware, software and telecommunications suppliers were very visible at the convention, offering video-conferencing facilities and a wide range of accredited 'telecourses'. The AACC convention featured a session led from Adelaide by staff from South Australia Technical and Further Education (TAFE), using relatively low-grade telephone links; such links are becoming almost a standard feature of the work of some colleges. Their efficiency has been enhanced by the use of ceiling microphones and surveillance cameras, controlled outside the classroom and so avoiding the intrusive effects of technicians, visible cameras and gooseneck microphones inside. One small college described its 16 camera system which was centrally controlled by one technician; it is used for remotely controlled testing and teaching.

The Internet is becoming as important a link between colleges across the USA as it has already become for universities. Course materials (for teaching purposes) are developed and shared. One group of colleges reported using a 'cyberbus' which travelled around a

rural part of the eastern USA providing Internet access to accredited distance learning courses. By modelling itself on farm co-operatives, another college has transformed itself into a 'communiversity' by pooling community resources to provide community bulletin boards, e-mail, library access, an interactive video network and an electronic shopping mall. Some states are giving priority to community access to the Internet — in Hawaii every student has free access. Colleges reported the impact of the new access tools, which can be learned in half an hour, in opening up the Internet to students and others who previously found it off-putting.

The skills needed to support and manage the information superhighways have been specified through the federally funded National Photonics Skills Standards Project. By the turn of the century, 400,000 additional technicians will be needed for this work and community colleges are being exhorted to establish the new courses which will bridge this gap. Work-based learning is promoted as the means to avoid expensive capital re-equipment across the community college sector.

Industry and student-centred learning

Individualised, student-centred learning is perceived mainly as a remedial need, particularly for high-school drop outs, who have not been able to succeed in the standard teacher-directed classrooms of American schools and colleges. Software has been developed for 'school-to-work' programmes, often funded by school districts which do not otherwise fund work in community colleges and federally funded 'tech-prep' initiatives.

The impact of changes in the secondary school curriculum are now bearing in on the community colleges, as they prepare to receive students whose teaching has included competence-based technical education taught through problem-solving approaches, rather than traditional didactic methods. Employers are seeking college graduates with relevant career-centred skills, including work behaviour skills, and are pressing for curriculum change. This is reinforced by messages (of rather dubious validity) which emphasise that successful careers demand computer literacy — two-thirds of college graduates use computers in their work, as opposed to less than one tenth of high-school drop outs.

Software packages are being developed for these new learning programmes. They are being used by colleges for remedial self-paced instruction, particularly in maths, reading and technical skills, although there are also courseware packages for parenting skills, substance abuse, etc. The packages are available in MS-DOS, Windows and CD-ROM formats and have built-in assessment to agreed national standards. Some of these packages are being used in conjunction with business and industry for work-based learning, as falling unemployment rates in some states mean that employers seek to enhance existing workers' skills, rather than recruit those with the requisite skills.

Summary

The complexities of a community college network with 1,500 colleges and 10 million students, organised in 50 different state systems, are impossible to capture in a short study visit. Every available technology seems to be in use, with ambitious plans to use technologies still just around the corner. Some crude generalisations of trends in the uses of technology for teaching and learning purposes are that:

- the Internet seems likely to reinforce the traditional, teacher-centred approaches which dominate college teaching, as teachers draw materials from each other for classroom use, and consign student-centred learning to the category of 'remediation'
- there has been and will continue to be heavy investment in the technologies for distance learning (or rather distance teaching) as colleges reach out to new markets and seek economies of scale, effectively increasing class sizes through technological means

- community colleges are firmly integrated with the US HE sector and are using technologies to reinforce their links with universities through franchises, shared teaching programmes and shared staff development programmes
- resource constraints are now encouraging colleges to look to business and industry as sources of support, not just as sponsors but as partners
- colleges are actively seeking to turn temporary students into permanent clients, partly through 'one-stop shop' approaches, selling on courses developed elsewhere and, more radically, considering how degrees might contain a time expiry date, after which statutory renewal is required

3. Multimedia and education

Nine months earlier, the committee received a report on the second annual international conference of the Association for the Advancement of Computing in Education (AACE), held in Vancouver in June 1994. Its theme was Educational Multimedia and Hypermedia. In view of the lively interest in the US and Canadian community college sectors in educational technology and new approaches to learning, it was a matter of some surprise that these sectors — and indeed technical and vocational education internationally — were eclipsed by the school and HE sectors at the conference. At a large conference with a host of parallel activities, it is impossible to attempt any comprehensive overview of activities, but the conference did provide participants with a six-inch-thick volume of proceedings, containing summaries or full papers from nearly 400 papers, demonstrations, panels, symposia and keynote speeches, so that on returning home they could appreciate that they had attended all the wrong sessions and missed all the really interesting ones.

Some generalisations reported to the committee from the 20 or so sessions attended were subsequently augmented by browsing through the proceedings.

Technology for teachers

The emphasis throughout the conference was very firmly on the use of the latest developments in technology to support teachers, rather than directly to enhance student learning. Technology is being deployed as a means of enabling teachers to reach larger numbers of students through bigger classes and to present information in more palatable doses to students. The only freedoms students had were to roam through pre-prepared hypermedia stacks according to teacher directions and to browse those stacks at their own pace in their own time. Only one keynote speaker, Ted Nelson (one of the pioneers who developed the computer industry in the 1960s), attacked the 'pre-Columbian' nature of CD-ROM — 'when you get to the end you fall off'.

There was little evidence that issues about student learning and the impact of technology on learning processes were being considered, still less researched. The focus on instruction rather than learning distracted attention from important issues about the ways in which students learn and whether different groups of students learn in significantly different ways.

There was little emphasis at the conference on using technology to support student-directed learning, perhaps a response to earlier fears that technology could be used to replace rather than support teachers. The overall impression was that the thinking behind the primitive linear 'programmed learning' technologies of the 1960s was still dominant, and that multimedia provided ways and means of programming learning in more sophisticated, but still very much predetermined modes. One significant exception was the keynote presentation of the British Open University's first integrated multimedia project, on the unlikely theme of 'Homer: Poetry and Society', a demonstration of guided discovery which showed what a classical education ought to involve.

Breaching the technological barriers

There was a good deal of confidence throughout the conference that the major developmental barriers to technology's use for educational purposes had been or were about to be removed. Oddly enough, most presentations suggested otherwise! They were dogged by technical failure and presenters' technical ineptitude in handling the now-ubiquitous computer-screen projection via overhead projector. However, the recurrent theme was that for 20 years the need for information-carrying networks which could carry not just text but also graphics, photographs, video and sound had impeded progress. Now these were available and the Internet (and the other global networks) provided a revolutionary new international information service at little or no cost; for example the state of Maryland had recently made Internet available to all its citizens for free.

However, new problems were emerging. They included the control of copyright and the

information overload (a dominant theme in informal discussions was the difficulty of wading through the vast numbers of e-mail messages on Internet, accumulating while participants were away in Vancouver!). Concerns were also expressed at the attempts (later abandoned) by the American government, through its 'clipper chip' proposal, to take control of Internet traffic, not just in the USA but globally; and the 'Balkanisation' of the Internet as more and more user groups pour ever-growing volumes of increasingly esoteric information along the new highways.

The impact of national initiatives

Presentations from the UK university sector drew attention, both directly and indirectly, to the achievements of the major national initiatives of the past decade — Computers in Teaching (CTI) and the Teaching and Learning Technology Programme (TLTP). While, with typical British self-deprecation, these were rarely lauded, they nonetheless contrasted sharply with the small-scale and short-term research initiatives in the North American university sector.

In the latter, the universities were competing for funding to support research and development from federal, private business and research foundation sources. The results were desperately disappointing. Paper after paper, not just from North America but from Europe and Asia, demonstrated only that university researchers are latching on to multimedia as the state-of-the art technology which brings in the research grants for small-scale, highly specialist studies whose effect on student learning is likely to be slight. Grant-winning seems to depend upon a catchy title, for example, 'Glucomedia', 'SMALLTALKER', 'COMPRAN' and 'button theory' are among the levers picked at random in the Proceedings.

A useful (and technically adept) presentation by John Castleford of Leicester University's CTI Centre for Geography, a consortium of 75 universities and one of the largest CTI projects, indicated the ways in which a national collaborative initiative was able to achieve outcomes beyond the scope of any single university project. While the problems faced in the early days by CTI were not shirked, the advantages of high-quality courseware available throughout the university sector were palpably demonstrated. Attention was also drawn to the complementarity of the CTI and TLTP initiatives, now that they were both funded through HEFC.

Publishing and multimedia

The American publishing industry is now taking seriously the business opportunities presented by multimedia in education. In keeping with the teacher (rather than student) focus, the emphasis is on generous give-aways to instructors in order to get them to invest in the new technologies which would then carry publishers' software.

At a publishers' symposium, the 'old' thinking of the major publishers contrasted sharply with the more imaginative approaches of small, new publishing houses, which were significantly from computing rather than publishing backgrounds. For example, the major publishers seemed to perceive multimedia publishing as no more than high-technology versions of text books. They refused to review copyright arrangements in ways which would allow the widespread networking of information, with tiny copyright payments for each use.

This idea is the dream of Ted Nelson, inventor of hypertext and a keynote conference speaker. His Xanadu projects have sought for years to find ways of networking copyrighted materials freely, with copyright payments made only when they are used. He claimed that the technology to achieve this was now available, but the publishing industry would not co-operate.

The Open Learning Agency

A conference presentation by Tony Bates (ex-Open University) was complemented by an afternoon visit to the Open Learning Agency (OLA) in East Vancouver. The keynote

presentation presented a vision of wideband information highways within the next decade. The challenge was to ensure that the educational and training services carried by these highways were relevant to users' needs. Informal work-based learning — a social as well as an individual activity — would accommodate individuals' distinctive learning styles, allowing them to access information and mentors as and when needed. The work undertaken by OLA in collaboration with other British Columbian organisations was cited as one means of providing the tools necessary for such workstation-based learning.

The visit to OLA indicated that current activities are, by necessity, rather more traditional than the vision the conference presented. The wide assortment of post-secondary open learning courses ranges from adult basic education to university-level programmes accredited by a number of Canadian universities. Most courses are short (up to four months) and many are bought in from other producers and broadcasters, including the North America-wide 'Open Campus', based at the University of Maryland. OLA has its own television channel, the *Knowledge Network*, reaching half a million British Columbian viewers a week.

Conclusions

Some questions raised for the Learning and Technology Committee by these experiences provided a structure for exploring international evidence. They are:

- What do we know about the ways in which students learn, and how is that knowledge relevant to the application of technology to learning?
- Are institutional initiatives or innovations designed primarily to facilitate student learning or to ease the tasks of teaching?
- Who is investing in learning technology research and development and why? What is the balance of national (regional), private business, research foundation and institutional research? How does that balance affect the direction taken by R&D?
- How do employers influence the teaching/learning approaches of post-secondary technical and vocational institutions (if at all)? Do they express preferences for on-job/work-based learning, off-job/college-based or off-job/home-based learning for their employees and potential employees?
- How do students make their views known with respect to the uses of technologies in their learning? Do they express preferences for teacher-directed or independent learning? Do different types of students express different preferences?

4. Learning technologies in industrial training

A short investigation early in 1995 looked at the uses made by major industries of information and learning technologies in their own training programmes. Visits to seven companies were complemented by an analysis of the available press clippings (see **1. Main themes from Learning & Technology Committee press surveys**) and a literature review. The key findings from the study are that:

- traditional classroom-based instructor-led training still forms a significant component of training delivery
- planning of training provision is directed toward the acquisition of training applications using new technologies and integrating technology-based training with classroom-based activity
- training requirements are determined through internal staff appraisal processes
- companies maintain dedicated training centres with banks of computer workstations, usually networked, along with video-conferencing and private broadcast facilities for multimedia transmission and Internet access
- custom-designed courseware is used along with customised commercial packages
- short, sharp training will be increasingly used to fill perceived gaps in personal, managerial or technical skills

Traditional classroom-based instructor-led training still forms a significant component of the delivery strategies in many of the companies visited. This type of delivery is frequently supported and/or complemented to varying degrees by the use of technology-delivered training.

More than half those interviewed claim that trainees prefer the classroom-based instructor-led training to other methods of delivery. In the absence of empirical evidence, it is not clear whether this is an accurate reflection of employees' preferences. However, the planning of training provision in most of the companies in this sample is directed toward the acquisition of training applications using new technologies.

While few of the organisations have a formal company training policy, all determine their training requirements through internal staff appraisal processes. Thus there is an emphasis on individuals taking responsibility for their own self-development, with line managers closely involved in ensuring that individual training needs are met for the people they manage. In many cases, individual development plans jointly agreed in the appraisal process form the basis of the internal training provision strategy.

All of the companies included in the sample maintain training facilities at each of their main sites. These dedicated training centres generally include a bank of computer workstations, usually networked. The range of capability of the workstations varies from 'dumb' terminals to very sophisticated 'intelligent' PC-based terminals. Some training centres provide mainly open learning facilities on terminals which may be networked or standalone. Common facilities include CD-ROMs, interactive video laserdisk, multimedia and, increasingly, CD-I machines.

Access to computer-based training from personal workstations is available in 70% of the companies included in the sample. In most cases, this is limited to only a subset of the available courseware in a company's training directory.

Videoconferencing facilities are currently available in five of the seven companies. However, only two have videoconferencing as as part of their training programme. Issues of cost seem to be the main factors limiting its use for training.

Multinationals are beginning to use private broadcast facilities for multimedia transmission. Internet and the World Wide Web are increasingly being used, although there is little evidence that they have yet been integrated into mainstream training programmes.

Most of the companies are involved in the development of custom-designed courseware. Companies such as Lloyds Bank both externally commission and internally develop training

packages for use on a variety of platforms, including CD-ROM, CD-I and multimedia. They work with producers of commercial training software to tailor it to cater for their specific requirements, while in-house units develop additional support materials to complement commercially produced training packages.

Accreditation of company training does not seem to be a significant issue for most of the companies, with the exception of those which are accredited training centres for generic software (e.g. products supplied by Microsoft, Novell, etc.). The other exception is Lloyds Bank which provides a wide range of NVQ-accredited programmes along with accredited assessor training and trainer training.

The trend in planning for the use of technology-delivered training programmes appears to be strongly focused on:

- integrating technology-based training with classroom-based activity
- focusing on short, sharp training to fill perceived gaps in personal, managerial or technical skills of the individual within their current job role
- maintaining an evolutionary 'up-skilling' trend
- developing a wider range of interactive multimedia training packages closely linked to the company's internal systems and products

5. Evidence for action

The considerable amount of information about innovations in information and learning technologies gleaned from the ongoing press surveys throughout most of the two year duration of the Learning & Technology Committee, the experiences shared by international educational institutions and the reports on visits to workplace training facilities all contributed to the evidence gathered by the Committee. The key messages and ideas gathered from these disparate sources, along with the findings of a series of complementary research studies and other evidence submitted by interested parties and expert witnesses, combined to inform the Committee's final report (*Report of the Learning & Technology Committee*, Further Education Funding Council, 1996).

Every source of enquiry highlighted the rapid development of information and learning technologies and their increasingly pervasive influence on almost all aspects of the lives of individuals and communities. There were numerous examples of innovative approaches to using technology to support and manage learning, although all too frequently these initiatives remained isolated from mainstream learning delivery practice. Consequently, there is still much 're-inventing of wheels' along with many lost opportunities to make a positive impact on the quality of the learning experiences available to most learners in educational institutions. This all points to the need for everybody involved in managing, delivering and administering FE to develop:

- more informed awareness of and commitment to the potential of the new and emerging information and learning technologies
- skills and confidence in using appropriate technological applications to facilitate learning

Collaborative projects involving a number of college partners are recommended by experienced educational technologists as the most viable way of developing relevant course and learning support materials. In most cases, collaboration offers a more efficient and effective use of scarce expertise and resources than single institution projects. While there is evidence of collaborative initiatives involving FE institutions in this country (e.g. the Further Education National Consortium), there is still much unrealised potential for mutually beneficial co-operation in tailoring information and learning technologies to meet learners' needs.

The evidence also suggests that open and distance learning is likely to surge in popularity as technology becomes increasingly interactive and user-friendly. Colleges which monitor such developments and position themselves to cater for this expanding market of open and flexible learners are likely to achieve an edge on their competitors.

Much of the groundwork of investigating potential applications of modern technologies for more effective teaching and learning has been done by relatively small numbers of educational technology enthusiasts. They have demonstrated via a myriad of isolated projects the added benefits which information and learning technologies can bring to the teaching and learning process. It is now time to disseminate these lessons throughout the educational and training communities. This will require visionary commitment by educational policy makers and managers of our educational institutions.

There is always resistance to change, but colleges of FE can no longer afford to ignore the role of modern technologies in promoting learning. Substantial investment will be required to reskill those involved in the delivery methods and administrative infrastructures which support learning and learners. The evidence gathered in the various studies reported here (and elsewhere) highlights the value of co-operative, collaborative approaches in producing cost-effective and mutually beneficial learning outcomes by the most effective application of information and learning technologies. No one can afford to observe learning technology developments either complacently or cynically from the sidelines. Everyone whose job is to support

learning in some way has a responsibility to familiarise themselves with the potential applications and use of modern technologies and actively to promote their use where they offer the most effective mode of delivery or support for learners and the learning process.

FEDA publications

Why not take out a subscription for Developing FE (FEDA Reports) and/or FE Matters (FEDA Papers) at substantially discounted rates?

Vol. 1 Developing FE (FEDA Reports) 10 issues for £95

Vol. 1 FE Matters (FEDA Paper) 20 issues for £110

Or subscribe to both series for only £170.

For further information about subscribing to or ordering FEDA's publications, contact: Anna Hickling, FEDA, Publications Department, Blagdon. Tel: [01761] 462503 Fax: [01761] 463140

The following publications are now available.

Developing FE (FEDA reports): Volume 1

All the documents in this series are priced at £10.00.

1. Student tracking

2. Caseloading

3. Assessing the impact

4. Adults and GNVQs

FE Matters (FEDA papers): Volume 1

All the documents in this series are priced at £6.50.

1. Environmental education throughout FE. 1: Policy and strategy

2. Environmental education throughout FE. 2: A model and unit of environmental learning outcomes

3. Colleges working with industry

4. Towards self-assessing colleges

5. Evidence for action: papers prepared for FEFC's Learning & Technology Committee

6. Student retention: case studies of strategies that work

Bulletins: Volume 1

All the documents in this series are priced at £3.50.

1. Developing college strategies for human resource development

2. Enhancing GCE A-level programmes

3. The impact of voucher schemes on the FE curriculum

4. Quality assurance in colleges

5. Maintaining quality during curriculum change

6. Action planning and recording achievement

7. Implementing modular A levels

8. Comparing content in selected GCE A levels and Advanced GNVQs

9. Engineering the future: monitoring the pilot GNVQ in Engineering

10. Charters in FE: making them work

11. Access to accreditation

12. Back to the future

13. Competing for business: colleges and the Competitiveness Fund

Books

Pragmatic prospects: developing LEA adult education

£12.00 ISBN: 0 907659 94 2

FE MATTERS

FEDA paper

Price: £6.50

ISSN 1361 - 9977

BEST COPY AVAILABLE